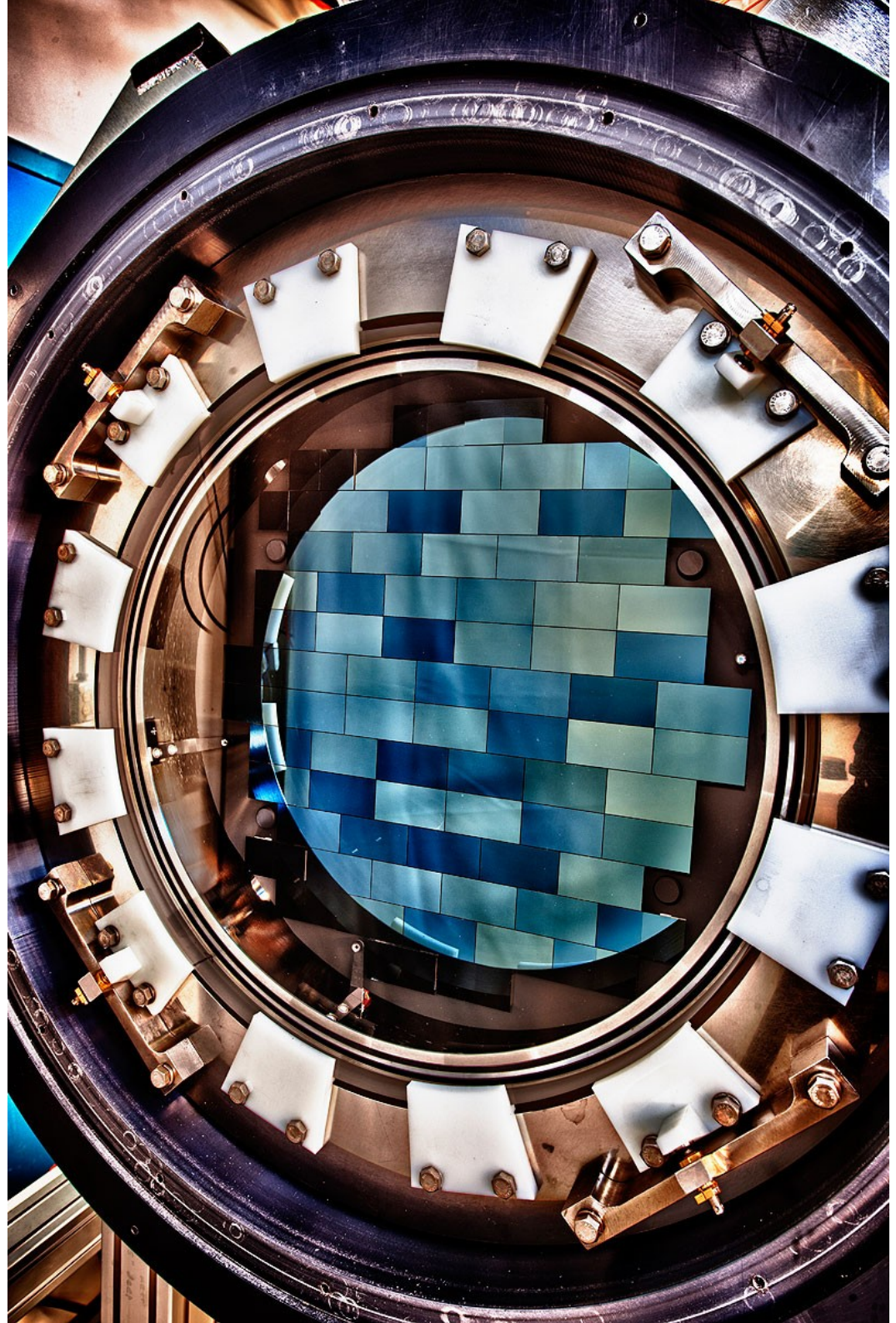


Dark Energy Camera (DECAM)

Each exposure
contains
62 2K x 4K CCDs
(500 Mpixels)
Exposure size: 1 GB
(Rice-compressed,
Lossy, x4)
105 nights/year
350 exposures/night



350 exposures/night.

300 science images (typically 60 in each of 5 filters grizY)

The other 50 exposures are 'calibration', most obtained near the beginning of the night. Some calibration exposure may be obtained over the course of weeks or months, and can be 'prepared' once and then used for processing weeks or months of exposures. In general,

A set of 10 biases or flats are averages to produce a single calibration bias/flat.

Operation Pipelines

Prep

PreCheck
Xtalk
SatMask
Overscan

On-incoming

Single Exp.

First Cut

Apply Bias/Flat
Apply IllumCor
*Astro (WCS)
Basic Catalog
PSM

Nightly

SE Final Cut

Apply Bias/Flat
Apply IllumCor
*Astro (reuse WCS)
Mask
Bkg
Psfmodel
PSM
Photcal
Remap (level0)
Corner finding (Mangle)

On-going (as SUPERCAL available)

COADD

Create Polygons
Refine ZP
Coadd_CRreject
Remap (refined)
Coadd
Create Tile Mask
Catalog
Update Obj w/Mask

Campaign

Calib Block ~~Supernovae~~

PreCal

Mkbiascor
Mkflatcor

On-incoming

SN

Apply Bias/Flat
Astro (WCS)
Diff images
Find

Candidates

Nightly

SUPERCAL

Mkbiascor
Mkflatcor
Mkillumcor

Weekly?

SN

Template

SE Final Cut
Steps

Campaign Alone

Individual Pipelines

(campaigns)

Global calibration
SE WL
ME WL
PHOTOz
Mangle

Per exposure, single epoch processing requirements:

Input: 3-4GB calib images (bias,flat,dark, illumination corr/sky flat) compressed.

Typically, 60 science exposures share single set of calibs.

Input: 1GB science exposure (62 CCDs) .fz comp.

Working RAM: 2-3 GB, Scratch disk: 20GB/exp.

Outputs: 2GB reduced image,
2GB remap image, 100MB catalogs,
logs

Precal (runs nightly)

Generates bias and flat (and dark) correction images from afternoon exposures

50 exposures in \rightarrow 6 1GB calibs out

SuperCal (runs weekly)

Generates Illumination correction from set of calibration images

50 exposures in \rightarrow 5 1GB calibs out (grizY)

Same 3-4GB of calib exposures can be used to process 1/5 of nightly exposures (60 of same filter color)

Once the calibration exposures are computed, one can begin the 'single epoch' processing steps.

These take about 4-5 hours to run (all 62 CCDs inside an exposure) on a single CPU. A 'simplified version' (closer to the CP version, or for SN) without PSF and model fitting, runs on an exposure in about 1.5 hours.

Once an exposure is through 'single epoch'

Single Epoch processing Block list:

```
SQL> select block_list from run  
       where run='20120126133309_20110726';
```

BLOCK_LIST

```
-----  
update_photflag,crosstalk_decam,createcor,  
incorrect_decam_photflat,  
create_illumc  
or,illum_correct,astrorefine_decam_test,scampqa,  
mask_decam,se_bkgd,remap,psfmodel_and_red_modelfit,  
psfex_qa,catalog_ingest,  
merge,psm,photcal
```

1.- crosstalk:

```
~/DES_HOME/sextest/bin/DECam_crosstalk /desar_archive_data/Archive/DES/src/20110726  
/src/decam-flat-g-3.fits /desar_archive_data/Archive/DES/red/20120126133309_20110726/raw/decam-  
flat-g-3/decam-flat-g-3 -verbose 3 -crosstalk /desar_archive_data/Archive/DES/cal/20100816_DECam  
/xtalk/DECam.xtalk -photflag 1
```

Sample 'command line call' in the existing single image processing. The file 'DECam.xtalk' is a (fixed) matrix of parameters fed in. -verbose, -photflag, are command line parameters.

This takes a flat field exposure, splits it into 62 CCDs, and applies the 'crosstalk correction' to each CCD.

6.1 catalog_exposure

More complex 'command line call'

```
~/DES_HOME/sextest/bin/runSExtractor /desar_archive_data/Archive/DES/red
/20120126133309_20110726/aux/reduced_images_copy_1066.list -terapixpath /share1/projects
/tg/descom/Sandbox-11222011/des_prereq/bin -binpath ~/DES_HOME/sextest/bin -etcpath
~/DES_HOME/sextest/etc -outputpath /desar_archive_data/Archive/DES/red
/20120126133309_20110726/red -scamp -weight_threshold 0.0 -detect_threshold 2.5

/share1/projects/tg/descom/Sandbox-11222011/des_prereq/bin/sex /desar_archive_data/Archive
/DES/red/20120126133309_20110726/red/decam- -20-0-Y-0/decam- -20-0-Y-0_56.fits[0] -c
~/DES_HOME/sextest/etc/sexforscamp.config -CATALOG_NAME /desar_archive_data/Archive/DES/red
/20120126133309_20110726/red/decam- -20-0-Y-0/decam- -20-0-Y-0_56_scamp.fits -CATALOG_TYPE
FITS_LDAC -WEIGHT_TYPE MAP_WEIGHT -WEIGHT_IMAGE /desar_archive_data/Archive/DES/red
/20120126133309_20110726/red/decam- -20-0-Y-0/decam- -20-0-Y-0_56.fits[2] -FLAG_IMAGE
/desar_archive_data/Archive/DES/red/20120126133309_20110726/red/decam- -20-0-Y-0/decam- -20-0-
Y-0_56.fits[1] -PARAMETERS_NAME /desar_archive_data/DES_HOME/sextest/etc/sex.param_scamp
-FILTER_NAME ~/DES_HOME/sextest/etc/sex.conv -STARNNW_NAME ~/DES_HOME/sextest
/etc/sex.nnw -WEIGHT_THRESH 0.0000 -SATUR_LEVEL 64224.3008 -DETECT_THRESH 2.5000

~/DES_HOME/sextest/bin/fwhm /desar_archive_data/Archive/DES/red/20120126133309_20110726
/red/decam- -20-0-Y-0/decam- -20-0-Y-0_56_scamp.fits /desar_archive_data/Archive/DES/red
/20120126133309_20110726/red/decam- -20-0-Y-0/decam- -20-0-Y-0_56.fits[0]
```

In order to keep up with the data stream during the regular observing season (105 nights from Sep-Feb), we should be able to process a nights 'single exposure' (and associated calibration generation) in 24 hours after the data is obtained.

Naively, about 300 CPUs working for 10 hours (6hrs S.E. + allowing time for database ingestion, file transfer), one CPU per exposure, serially processing The 62 sub CCDs in a given exposure, would do the job.

After Single epoch, the data catalogs
Are ingested into the database.
the 'remap' (geometrically aligned on
a grid) images are 'set aside' to be
Used in the 'coadd step'.

Other 'processing blocks' involve:
Supernovae processing (simplified
Single epoch + difference imaging).

Weak lensing (cpu intensive, SE + coadd)
Photo-z, 'final' global calibration

Here's
A
DC6B2
coadd
exposure
close
up.

Stars,
galaxies,
defects,
and noise
dominate
the image

